

APPENDIX I

GLOSSARY

ADDEND —A number to be added to an augend.

ADDITION —A form of counting where one quantity is added to another.

AND GATE —A logic circuit in which all inputs must be HIGH to produce a HIGH output.

ASSOCIATIVE LAW —A simple equality statement $A(BC) = ABC$ or $A+(B+C) = A+B+C$.

AUGEND —A number to which another number is to be added.

BASE —The number of symbols used in the particular number system.

BCD (BINARY CODED DECIMAL) —A method of using binary digits to represent the decimal digits 0 through 9.

BINARY SYSTEM —The base 2 number system using 0 and 1 as the symbols.

BOOLEAN ALGEBRA —A mathematical concept based on the assumption that most quantities have two possible conditions —TRUE and FALSE.

BOOLEAN EXPRESSION —A description of the input or output conditions of a logic gate.

BORROW —To transfer a digit (equal to the base of the number system) from the next higher order column for the purpose of subtraction.

CARRY —A carry is produced when the sum of two or more numbers in a vertical column equals or exceeds the base of the number system in use.

CLOCK —A circuit that generates timing control signals in a computer or other type of digital equipment.

COMMUTATIVE LAW —The order in which terms are written does not affect their value; $AB = BA$, $A+B = B+A$.

COMPATIBILITY —The feature of logic families that allows interconnection of circuits without the need for additional circuitry.

COMPLEMENT —Something used to complete something else.

COMPLEMENTARY LAW —A term ANDed with its complement is 0, and a term ORed with its complement is 1; $A \bar{A} = 0$, $A + \bar{A} = 1$.

CONVERSION —To change a number in one base to its equivalent in another base.

COUNTER —A device that counts.

D FLIP-FLOP —Stores the data bit (D) in conjunction with the clock input.

DECADE COUNTER —Counter from 0 to 10_{10} in base 2, then resets.

DECIMAL POINT —The radix point for the decimal system.

DECIMAL SYSTEM—A number system with a base or radix of 10.

DEMORGAN'S THEOREM—This theorem has two parts: the first states that $\overline{AB} = \overline{A} + \overline{B}$; the second states that $\overline{A + B} = \overline{A} \overline{B}$.

DIFFERENCE—That which is left after subtraction.

DISTRIBUTIVE LAW—(1) a term (A) ANDed with a parenthetical expression (B+C) equals that term ANDed with each term within the parenthesis: $A(B+C) = AB+AC$; (2) a term (A) ORed with a parenthetical expression (BC) equals that term ORed with each term within the parenthesis: $A+(BC) = (A+B)(A+C)$.

DIVIDEND—A number to be divided.

DIVISOR—A number by which a dividend is divided.

DOUBLE NEGATIVE LAW—A term that is inverted twice is equal to the term; $\overline{\overline{A}} = A$.

DOWN COUNTER—A circuit that counts from a predetermined number down to 0.

EXCLUSIVE-NOR (X-NOR)—A logic circuit that produces a HIGH output when all inputs are LOW or all inputs are HIGH.

EXCLUSIVE-OR (X-OR) GATE—A logic circuit that produces a HIGH output when one and only one input is HIGH.

EXPONENT—A number above and to the right of a base indicating the number of time the base is multiplied by itself; $2^4 = 2 \times 2 \times 2 \times 2$.

FLIP-FLOP—A bistable multivibrator.

FRACTIONAL NUMBER—A symbol to the right of the radix point that represents a portion of a complete object.

HEXADECIMAL (HEX) SYSTEM—The base 16 number system using 0 through 9 and A, B, C, D, E, and F as symbols.

IDEMPOTENT LAW—States that a term ANDed with itself or ORed with itself is equal to the term; $AA = A$, $A+A = A$.

INVERTER—A logic gate that outputs the complement of its input.

J-K FLIP-FLOP—Can perform the functions of the RS, T, and D flip-flops.

LAW OF ABSORPTION—This law is the result of the application of several other laws. It states that $A(A+B) = A$ or $A+(AB) = A$.

LAW OF COMMON IDENTITIES—The two statements $A(\overline{A} + B) = AB$ and $A + \overline{A} B = A+B$ are based on the complementary law.

LAW OF IDENTITY—States that a term TRUE in one part of an expression will be TRUE in all parts of the expression; $A = A$, $\overline{\overline{A}} = \overline{A}$.

LAW OF INTERSECTION—A term ANDed with 1 equals that term, and a term ANDed with 0 equals 0; $A \cdot 1 = A$, $A \cdot 0 = 0$.

LAW OF UNION —A term ORed with 1 equals 1; a term ORed with 0 equals that term; $A+1 = 1$, $A + 0 = 0$.

LEAST SIGNIFICANT (LSD) —The digit which has the least effect on the value of a number.

LOGIC —The science of reasoning; the development of a reasonable or logical conclusion based on known information.

LOGIC FAMILY —A group of logic circuits based on specific types of circuit elements (DTL, TTL, CMOS, and so forth).

LOGIC GATES —Decision-making circuits in computers and other types of equipment.

LOGIC POLARITY —The polarity of a voltage used to represent the logic 1 state.

LOGIC SYMBOL —Standard symbol used to indicate a particular logic function.

MINUEND —The number from which another number is subtracted.

MIXED NUMBER —Represents one or more complete units and a portion of a single unit.

MODULUS —The number of different values that a counter can contain or display.

MOST SIGNIFICANT DIGIT (MSD) —The digit which if changed will have the greatest effect on the value of a number.

NAND GATE —An AND gate with an inverted output. The output is LOW when all inputs are HIGH, and HIGH when any or all inputs are LOW.

NEGATIVE LOGIC —The voltage representing logic state 1 is more negative than the voltage representing a logic state 0.

NEGATOR —See inverter.

NOR GATE —An OR gate with an inverted output. The output is LOW when any or all inputs are HIGH, and HIGH when all inputs are LOW.

NOT CIRCUIT —See inverter.

NUMBER —A symbol used to represent a unit or a quantity.

OCTAL SYSTEM —The base 8 number system using 0 through 7 as the symbols.

OR GATE —A logic circuit which produces a HIGH output when one or more inputs is/are HIGH.

PARALLEL DATA —Each bit of data has a separate line and all bits are moved simultaneously.

PARALLEL REGISTER —A register that receives, stores, and transfers data in a parallel mode.

POSITIONAL NOTATION —A method where the value of the number is defined by the symbol and the symbol's position.

POSITIVE LOGIC —The voltage representing logic state 1 is more positive than the voltage representing a logic state 0.

POWER OF A NUMBER —The number of times a base is multiplied by itself. The power of a base is indicated by the exponent; that is, $10^3 = 10 \times 10 \times 10$.

QUOTIENT —The result in division.

RADIX POINT —The symbol that separates whole numbers and fractional numbers.

RADIX —The total number of symbols used in a particular number system.

REGISTER —A circuit of flip-flops designed to receive, store, and transfer data.

REMAINDER —The final undivided part that is less than the divisor.

RING COUNTER —A loop in which only one flip-flop will be set at any given time; used in timing.

RIPPLE (ASYNCHRONOUS) COUNTER —A circuit that counts from 0 to a specified value. Subject to error at high frequency.

R's (RADIX) COMPLEMENT —The difference between a given number and the next higher power of the number system (1000_8 minus 254_8 equals 524_8).

R's-1 (RADIX-1) COMPLEMENT —The difference between a given number and the highest value symbol in the number system (777_8 minus 254_8 equals 524_8).

R-S FLIP-FLOP —A flip-flop with two inputs —S (set) and R (reset). The Q output is HIGH in the set mode and LOW in the reset mode.

SERIAL DATA —All data bits are transferred one bit at a time along a single conductor.

SHIFT REGISTER —A register capable of serial-to-parallel and parallel-to-serial conversion and scaling.

SHIFTING —Moving the contents of a register right or left to scale the number or to input or output serial data.

SUBSCRIPT —A number written below and to the right of a value indicating the base or radix of the number system in use (35_8).

SUBTRACTION —Taking away one number from another.

SUBTRAHEND —The quantity to be subtracted from the minuend.

SUM —The result in addition.

SYNCHRONOUS COUNTER —Performs the same function as a ripple counter but error free at high frequency.

T FLIP-FLOP —A single input flip-flop that changes state with each positive pulse or each negative pulse. Divides input frequency by two.

TRUTH TABLE —A chart showing all possible input combinations and the resultant outputs.

UNIT —A single object.

UP/DOWN COUNTER —A counter circuit that can count up or down on command.

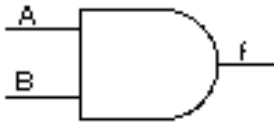

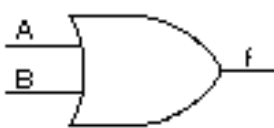

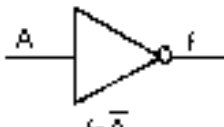
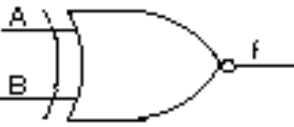

VINCULUM —A bar over a logic statement indicating the FALSE condition of the statement.

WHOLE NUMBER —A symbol that represents one or more complete objects.

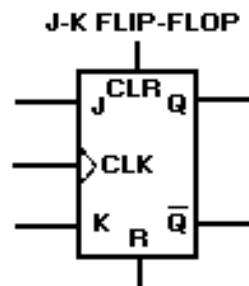
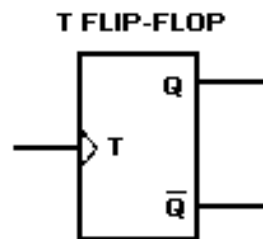
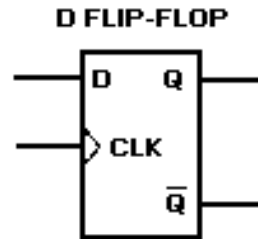
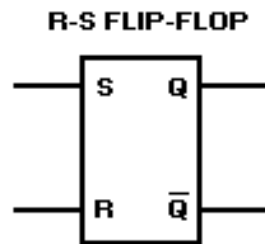
ZERO —A symbol that indicates no numerical value for a position in positional notation.

APPENDIX II

LOGIC SYMBOLS

AND  $f = AB$ <table><tr><th>A</th><th>B</th><th>f</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td></tr></table>	A	B	f	0	0	0	0	1	0	1	0	0	1	1	1	NOR  $f = \overline{A+B}$ <table><tr><th>A</th><th>B</th><th>f</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table>	A	B	f	0	0	1	0	1	0	1	0	0	1	1	0
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OR  $f = A+B$ <table><tr><th>A</th><th>B</th><th>f</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td></tr></table>	A	B	f	0	0	0	0	1	1	1	0	1	1	1	1	EXCLUSIVE-OR  $f = A \oplus B = \overline{A}B + A\overline{B}$ <table><tr><th>A</th><th>B</th><th>f</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table>	A	B	f	0	0	0	0	1	1	1	0	1	1	1	0
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INVERTER  $f = \overline{A}$ <table><tr><th>A</th><th>f</th></tr><tr><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td></tr></table>	A	f	0	1	1	0	EXCLUSIVE-NOR  $f = \overline{A \oplus B}$ <table><tr><th>A</th><th>B</th><th>f</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td></tr></table>	A	B	f	0	0	1	0	1	0	1	0	0	1	1	1									
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Logic Symbols (Cont'd)



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